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THE BRYOPHYTE AND VASCULAR FLORA OF LITTLE DOLLAR LAKE PEATLAND, MACKINAC COUNTY, MICHIGAN

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ABSTRACT. Little Dollar Lake peatland is a 14 ha, lake-fill, poor fen peatland complex on Michigan's Upper Peninsula. Field studies over three years revealed the peatland to be composed of seven contiguous mats characterized by several habitats. These habitats included narrow floating mats; extensive grounded mats with hummock-hollow zonation dominated by *Sphagnum* spp., *Chamaedaphne calyculata,* and *Carex oligosperma*; and a lagg adjacent to the upland. Lagg habitats were dominated by *Carex* spp. and *Calamagrostis canadensis.* The bryophyte flora of the peatland was characterized by eleven species of *Sphagnum* that dominated the floating and grounded mats surrounding Little Dollar Lake. The total bryophyte flora (liverworts, peat mosses, and mosses) consisted of 36 species while the vascular flora (pteridophytes, gymnosperms, and angiosperms) consisted of 93 species.

Key Words: peatland, *Sphagnum,* bryophyte flora, vascular flora, Michigan

Due to their confined topography, daunting physical conditions, limited mineral availability, relatively conservative flora, and readily apparent vegetation patterns, peatlands have been examined by a wealth of floristic and ecological studies throughout North America. Since the early 1900s, peatlands of eastern upper Michigan have been the topic of numerous ecological investigations (Woollett et al. 1926; Sigler and Woollett 1927; Dean and Coburn 1928; Coburn et al. 1933; Gates 1942; Bevis 1960).

In the 1970s, Vitt and Slack (1975) discussed the environmental factors influencing plant distribution in kettle-hole peatlands dominated by *Sphagnum.* Vitt et al. (1975) examined the zonation of *Sphagnum* species along the hummock-hollow gradient in northern Michigan peatlands. Schwintzer and Williams (1974) summarized the changes in vegetation zonation through time in a small lake-fill peatland. Schwintzer (1978, 1981) and Schwintzer and Tomberlin (1982) investigated ground water and nutrient dynamics of northern Michigan peatlands and similar wetlands. In the 1980s, research shifted to the postglacial development of northern Michigan peatlands (Futyma 1982; Futyma and Miller 1986; Miller and Futyma 1987; Madsen 1989).

Discussions of vegetation have relied mostly on vegetation sampling or rough species lists, not on a complete inventory of the bryophyte and vascular species inhabiting the study sites. This study, and a companion paper (Hellquist and Crow, ms. in prep.), will detail the species composition and associations of bryophytes and vascular plants at Little Dollar Lake peatland.

SITE DESCRIPTION

Site characteristics. Little Dollar Lake (46°11′05″ N, 85°18′20″ W) is in Lake Superior State Forest in Michigan's eastern Upper Peninsula in west-central Mackinac County (T44N, R8W, NE1/4 Sec. 28, Hudson Township), approximately seven miles north of Lake Michigan. The peatland basin is approximately 14 hectares (34 acres) in area, with the surface of Little Dollar Lake comprising 5.6 hectares (14 acres) of the basin surface area (Humphrys and Greene 1965; Figure 1). Little Dollar Lake is shallow (1.3 m–2.0 m; Futyma, field notes of July 24, 1979), and over half of the original expanse of open water has been covered by peatland vegetation (Futyma 1982). The lake is acidic with a mean pH of 4.5 (n = 40, range 4.2–4.8; August 20, 1995) along the shoreline. The peatland basin is shallow, with depths to nonpeat substrates one to almost four meters (Hellquist 1996).

Although the basin shows no active surficial outflow, it does have a relict stream channel on the southern mat colonized largely by *Carex lasiocarpa* and a stagnant outlet/beaver channel at the north end of the basin. Futyma (1982) concluded that any drainage out of the basin was presumably through seepage. Beaver activity in the lake basin was apparent to Futyma in the late 1970s and early 1980s, yet no damming was observed. No beavers or beaver dams were observed during the summers of 1994 through 1996, although three beaver lodges, in various states of maintenance, were found along the lake margin. Trees recently felled by beavers were observed in the surrounding uplands during 1995.

The adjacent upland. The Little Dollar Lake peatland basin is surrounded by gently undulating glacial topography. This land-

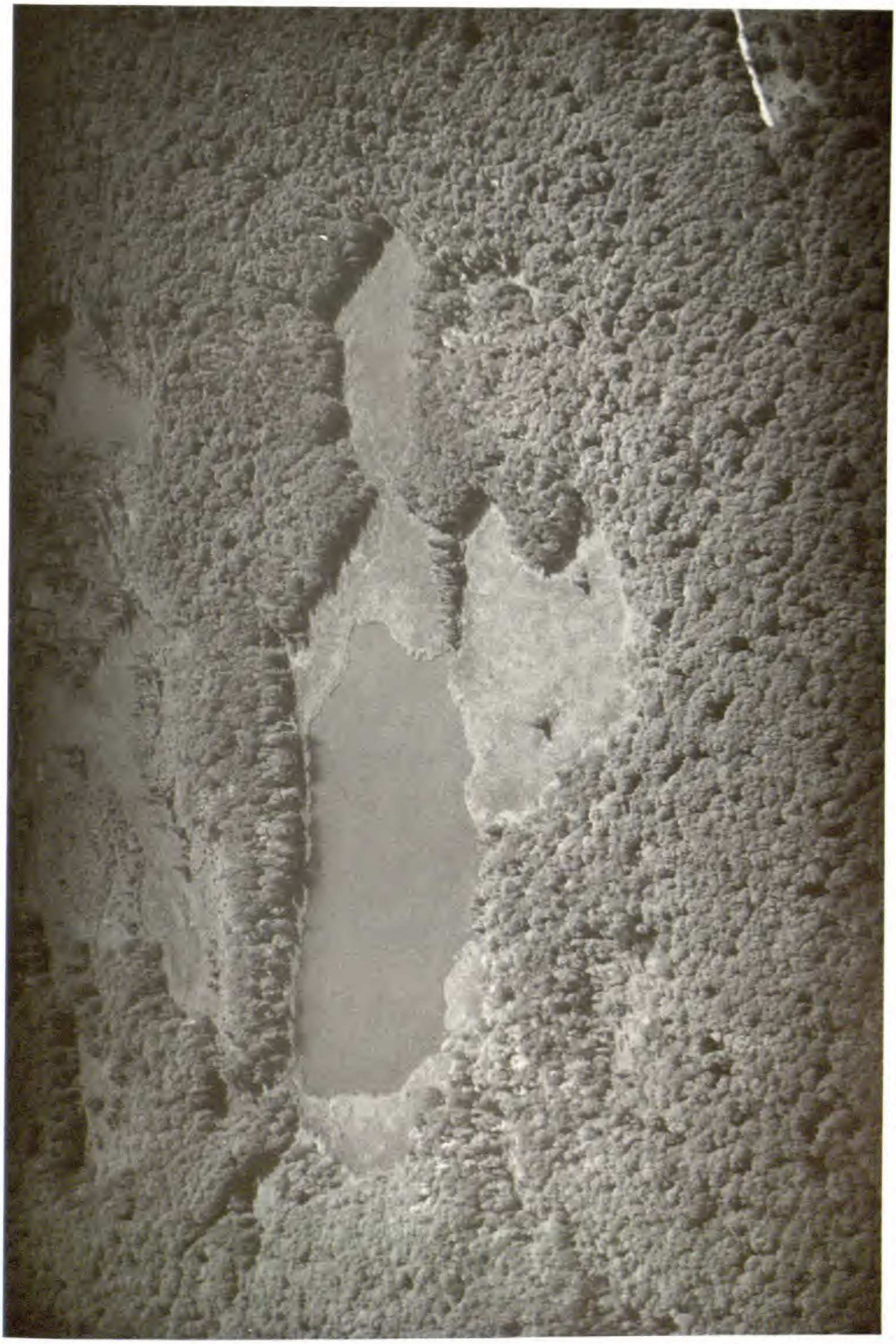

Figure 1. Oblique aerial view of Little Dollar Lake peatland. Photograph by Lauren C. Wemmer: 24 July 1995.

scape supports northern hardwood forests with a mixture of conifers and deciduous hardwoods of the "hemlock-white pine-northern hardwoods region" of Braun (1950). Hardwood species include *Acer pensylvanicum* L., *A. rubrum, A. saccharum, A. spicatum* Lam., *Betula alleghaniensis, B. papyrifera,* and *Fagus grandifolia* Ehrh. Conifers are represented by *Abies balsamea, Picea glauca* (Moench) Voss, *Pinus strobus,* and *Tsuga canadensis* (L.) Carrière. This forest also has a rich understory of herbaceous vegetation including *Pteridium aquilinum* (L.) Kuhn, *Huperzia lucidula* (Michx.) Trevisan, *Lycopodium clavatum* L., *Allium tricoccum* Aiton, *Clintonia borealis* (Aiton) Raf., *Cornus canadensis* L., *Cypripedium acaule* Aiton, *Gaultheria procumbens* L., *Maianthemum canadense* Desf., *Medeola virginiana* L., and *Trientalis borealis* Raf.

As part of Lake Superior State Forest, the forests surrounding Little Dollar Lake are periodically logged. The most valuable timber is in stands of northern hardwoods classified as fully stocked with predominately log-sized timber (Area Forest Manager D. I. Reid 1996, pers. comm.). Clear-cutting occurred to the north-northeast of the lake in 1990. In 1994, selective timber harvests occurred to the south-southwest of the lake (Figure 2). The northern hardwood stands to the south-southwest of the lake and bordering the southwestern peatland mat are scheduled to be selectively harvested again in fifteen years. Northern hardwood stands to the west and north are scheduled to be logged within five years, whereas the stands of *Betula papyrifera* to the east and southeast of the peatland will remain as buffers between logged acreage and the peatland basin (D. I. Reid 1996, pers. comm.).

Although large, charred stumps were observed on the upland ridge to the east of the peatland basin, the peatland has not been seriously affected by any recent fire events based on the absence of charcoal fragments in sediment cores and pollen diagrams (Futyma 1982). Area Forest Manager D. I. Reid (1996 pers. comm.) had no records available relating to the fire history of the area, but asserted that there has been no burning in that area since at least 1977.

Soils of the upland and peatland basin. The upland substrates immediately surrounding Little Dollar Lake are coarse tills and undifferentiated glacial deposits dominated by sand, clay, and

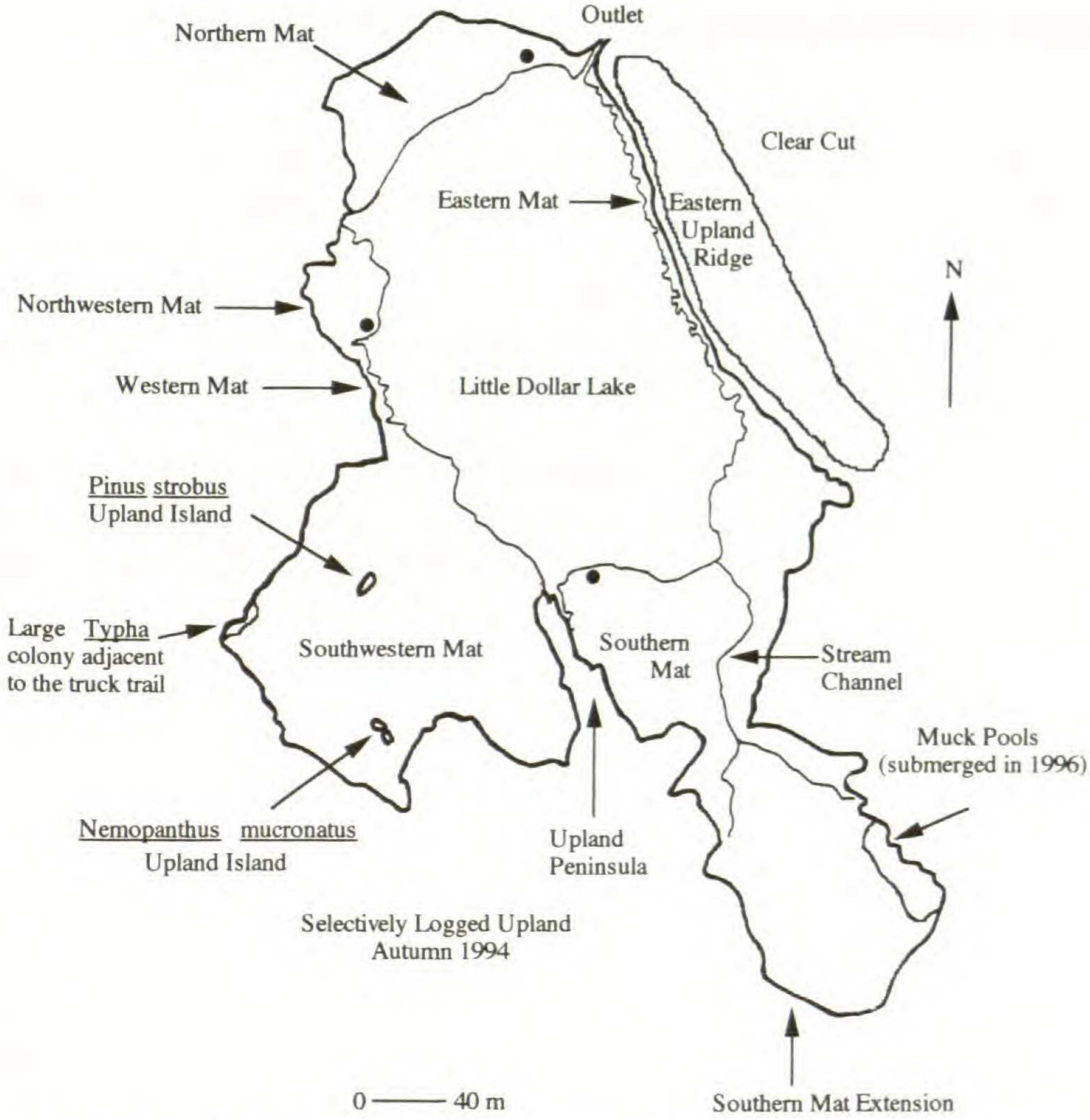

Figure 2. Map of Little Dollar Lake peatland illustrating selected features of local geography around and in the peatland basin. Solid dots indicate the positions of old beaver lodges. Scale is approximate.

loam in various proportions (Farrand 1982). These sandy upland soils include Wallace sand (6–15% slopes), Springlake loamy coarse sand (6–15% slopes), and Paquin-Finch sands (0–6% slopes; Anonymous 1995). Wallace and Springlake sands characterize gently rolling dunes, outwash plains, and lake plains; Paquin sands level or undulating topography; and Finch sands level areas on lake and outwash plains (Anonymous 1995).

The organic soils within the peatland basin are classified as Dawson and Loxley soils (Anonymous 1995). These soils have a high water capacity, are characteristically deep and very poorly drained, and develop in depressed areas on moraines as well as lake and outwash plains. Horizons in Dawson soil profiles usually contain layers of yellowish brown peat, followed by black muck, and grayish brown to yellowish brown sand. Loxley soils tend to be more uniform in composition with a shallow upper layer of dark yellowish brown peat followed by a more extensive zone of black and dark reddish brown muck. Ponded histosols and aquents, characteristic of depressions, beaver dam areas, and marshes, are also present at the north end of the lake near the outlet/beaver channel (Anonymous 1995).

Climate. The local climate of the Little Dollar Lake vicinity is strongly influenced by its proximity to both Lake Michigan, approximately 11 km (7 mi.) to the south, and Lake Superior, approximately 58 km (36 mi.) to the north and 48 km (30 mi.) to the northeast. The Great Lakes have a moderating effect on local weather conditions, with their water remaining cool in the summer and freezing slowly in winter months, creating cloudy, wet conditions (NOAA 1995). Due to the low elevation of eastern upper Michigan (ca. 700–800 ft.), and a lack of physical relief, topography has virtually no influence on the local climate (NOAA 1995).

The closest full scale climatological station operated by the National Oceanic and Atmospheric Administration (NOAA) is located approximately 72 km (45 mi.) to the northeast of Little Dollar Lake at Sault Ste. Marie, Michigan. The average date of the first frost is September 27 and the average date of the last frost is May 26. On average, snow remains on the ground from mid-November to the first week in April. Snowfall totals in Sault Ste. Marie range from approximately 30″ to over 175″. Total snowfall for the winter of 1994–1995 was 93.7″ (NOAA 1995).

At Sault Ste. Marie the mean monthly temperatures for June, July, and August are 58.0°F, 63.8°F, and 62.6°F, respectively (NOAA 1995). In 1995, the average temperatures for the months of June, July, and August were 63.4°F, 63.7°F, and 66.1°F, respectively (NOAA 1995). The normal yearly precipitation (water equivalent) at Sault Ste. Marie is 34.23″ (NOAA 1995). Total precipitation for 1995 was 45.84″ (NOAA 1995). Normal monthly precipitation for June, July, and August at Sault Ste. Marie is 3.14″, 2.71″, and 3.61″, respectively. The monthly precipitation for June, July, and August of 1995 was 2.17″, 3.54″, and 6.52″, respectively (NOAA 1995).

Postglacial history of Little Dollar Lake peatland. Futyma (1982) outlined events surrounding the postglacial revegetation of eastern upper Michigan through the analysis of lake sediments and pollen, some of which were extracted from Little Dollar Lake. During the hypsithermal period following the retreat of the Valders or Greatlakean ice sheet, between 8000 and 5000 years before present (B.P.), the upper Great Lakes region was experiencing the warmest and driest climate of the postglacial epoch. Despite these dry conditions, sediment stratigraphy indicated that the Little Dollar Lake basin was intermittently flooded. Pollen analysis of the sediments of Little Dollar Lake revealed the presence of *Nymphaea* sp., *Nuphar* sp., and *Brasenia schreberi* J. F. Gmelin in the basin at more than 6000 years B.P. (Futyma 1982). The presence of these floating-leaved aquatic species indicates that an extensive expanse of shallow water was present within the basin at this time. Prior to this interval, the lake was either smaller in extent or dry. Following its peak pollen abundance (just prior to 6000 years B.P.), *B. schreberi* pollen levels declined in the next two to three thousand years (Futyma 1982). Today *B. schreberi,* a species of quiet, acidic waters (Voss 1985), does not inhabit Little Dollar Lake.

At approximately 4500 years B.P., a climate shift occurred that resulted in a one to two meter increase in regional water tables. By 3500 years B.P., this gradual increase of the regional water table had inundated the Little Dollar Lake basin creating the lake ancestral to contemporary Little Dollar Lake (Futyma 1982). Further increases in water levels and subsequent flooding began to erode the surrounding upland causing the deposition of a sand layer that was apparent 133–137 cm below the present day lake bottom. Once shore stabilization was established, sand deposition subsided and organic sedimentation occurred. Presumably, this increase in organic material marked the genesis of the contemporary peatland that surrounds Little Dollar Lake (Futyma 1982).

Vegetation of the constituent peatland mats. Based on the bryophyte and vascular species associations within the basin, three major vegetation community types were delineated. Each community consisted of two phases or subtypes (Hellquist 1996; Hellquist and Crow, ms. in prep.). The outermost community of the peatland was a graminoid lagg (moat) characterized by *Cal-*

amagrostis canadensis and *Carex lasiocarpa,* as well as *Iris versicolor, Lysimachia thyrsiflora,* and *Triadenum fraseri.*

The second major community type was an ericaceous scrub, concentrated on the grounded mat. The ericaceous scrub was dominated by *Sphagnum* spp., *Chamaedaphne calyculata, Kalmia polifolia, Andromeda glaucophylla,* and *Carex oligosperma.* The grounded mat blended into a narrow floating *Sphagnum* lawn at the lake margin where species such as *Scheuchzeria palustris, Sarracenia purpurea,* and *Eriophorum virginicum* grew in abundance.

The third major peatland community consisted of an association characteristic of a stream channel area (Figure 2). This channel apparently was open water based on a 1978 infrared aerial photograph of the peatland (Hellquist 1996). Although flooded in years when the water table is high, this channel is now almost entirely colonized by an unstable, floating network of *Carex lasiocarpa, Menyanthes trifoliata, Potentilla palustris,* and *Triadenum fraseri.*

The peatland surrounding Little Dollar Lake consisted of seven spatially distinct mats (Figure 2). Since Little Dollar Lake is situated in an approximately north-south lengthwise orientation, the mats were identified based upon their relative compass-point around the lake perimeter. The northern mat was abutted by a lagg community dominated by *Calamagrostis canadensis.* The majority of the mat was covered by an ericaceous scrub that subsequently merged into a narrow band of *Sphagnum* lawn along the lake shore.

The eastern shore of Little Dollar Lake was fringed by an irregular, narrow (ca. 5.0–10.0 m wide) floating mat similar in appearance and species composition to the western mat (Figure 2). The dominant bryophytes were *Sphagnum majus* and *S. recurvum.* The ericaceous scrub of the eastern mat was distinguished by its high hummocks colonized by robust individuals of *Chamaedaphne calyculata, Kalmia polifolia,* and *Vaccinium macrocarpon.*

The southern mat was very similar in physiognomy to the southwestern mat, having a *Calamagrostis canadensis*-dominated graminoid lagg community, ericaceous scrub community, and a narrow *Sphagnum* lawn along the lake margin. At its southern limits this mat gradually narrowed into a constriction, then flared out into a long, narrow mat named the "southern mat extension" (Figure 2).

The southern mat extension was characterized by an ericaceous scrub community and a diverse *Calamagrostis canadensis* lagg community. The southern mat and its extension were distinctive due to the presence of a meandering stream channel and the nearby "muck pools." The stream channel originated in an open area of peaty muck in the eastern lagg of the southern mat extension, and wound through the southern mat extension and the southern mat, eventually reaching the lake (Figure 2). A second muck pool was located near the southeastern corner of the eastern lagg of the southern mat extension. During the summer of 1994 and 1995 these areas were composed of a soupy peat, but during the summer of 1996 they were flooded by over 0.25 m of water.

The southwestern mat possessed a floating *Sphagnum* lawn community along the margin of the lake, although the physiognomy of this mat was distinguished by an extensive ericaceous scrub that was bordered along the upland by a *Calamagrostis canadensis* lagg association. In the southwestern mat's basin there are two small, upland, mineral soil communities with a suite of species different from those of the ericaceous scrub (Figure 2). The larger island is topped with mature individuals of *Acer rubrum* (15 cm diameter at breast height [dbh]), *Betula papyrifera, Pinus strobus* (28 cm dbh), and an understory of *Chamaedaphne calyculata, Gaylussacia baccata* (Wangenh.) K. Koch, *Vaccinium angustifolium,* and *Pteridium aquilinum.* The smaller of the two islands on the southwestern mat is dominated by one large *Pinus strobus* (30.7 cm dbh) and eight clumps of *Nemopanthus mucronatus.* The southwestern mat and the southern mat are separated by an elevated, finger-like projection of upland that protrudes northward to the open water of Little Dollar Lake (Figure 2).

Like the northern mat, the northwestern mat was relatively narrow with an extensive ericaceous scrub that blended into a narrow *Sphagnum* lawn at the lake margin (Figure 2). The periphery of this mat was composed of a *Calamagrostis canadensis*-dominated lagg community or a *Chamaedaphne calyculata* community that directly abutted the upland. Near Little Dollar Lake, this mat was perforated with holes that apparently have been accentuated by beaver activity.

The northwestern mat and the southwestern mat were joined by the narrow western mat. Like the narrow eastern mat, the western mat was situated along a steep-sloped upland and was characterized by an ericaceous scrub with high hummocks and wet hollows. At its broadest, the western mat was approximately 11.0 meters wide (Figure 2).

MATERIALS AND METHODS

The floristic survey began during July and August of 1994. During the summer of 1995, Little Dollar Lake peatland was visited a minimum of two times a week to inventory the flora and conduct a vegetation analysis (Hellquist 1996). The peatland was visited during the summer of 1996 also. Throughout the summer of 1995, all habitats were thoroughly explored in the peatland basin.

Species found colonizing old beaver lodges were included in the flora since these plants were growing on peat excavated from the peatland mat by beaver to cover the branches and debris on the lodges. Species that occurred only on the small islands of upland mineral soil stranded in the southwestern peatland mat, such as *Pteridium aquilinum* and *Gaylussacia baccata,* were not included in the flora. These species were excluded due to their establishment on upland mineral soils that were not influenced by the unique physical conditions characteristic of peat substrates.

Taxonomy of the bryophyte classes follows a summary presented in Crum (1991). Bryophyte nomenclature at the family, generic, and species levels follows Stotler and Crandall-Stotler (1977) for the liverworts, Anderson (1990) for the peat mosses, and Anderson et al. (1990) for the mosses. Bryophyte species were identified using Crum and Anderson (1981), Ireland (1982), Crum (1983, 1991), and Smith (1990).

Taxonomy and nomenclature for ferns, fern allies, and gymnosperms follows *Flora of North America* (Flora of North America Editorial Committee 1993). Angiosperm taxonomy follows Cronquist (1981) as well as *Flora of North America* for the Magnoliidae and the Hamamelidae (Flora of North America Editorial Committee 1997). With a few exceptions, nomenclature follows Gleason and Cronquist (1991). Angiosperm species were identified using Gleason (1952), Voss (1972, 1985), and Gleason and Cronquist (1991).

Voucher specimens of the bryophyte and vascular species are deposited in the Hodgdon Herbarium of the University of New

Table 1. Total species and percent composition of higher taxonomic levels of bryophytes and vascular plants at Little Dollar Lake peatland.

	Number of Species	Percent of Flora
BRYOPHYTES	36 Total	
HEPATICOPSIDA (Liverworts)	6	16.7
SPHAGNOPSIDA (Peat Mosses)	11	30.6
BRYOPSIDA (Mosses)	19	52.8
VASCULAR PLANTS	93 Total	
PTERIDOPHYTES (Ferns & Allies)	5	5.4
GYMNOSPERMS (Conifers)	5	5.4
ANGIOSPERMS (Flowering Plants)	83	89.2

Hampshire (NHA) and the University of Michigan Biological Station Herbarium (UMBS).

RESULTS

The bryophytes of Little Dollar Lake peatland were represented by 14 families, 20 genera and 36 species of liverworts, peat mosses, and true mosses (Table 1). The liverworts consisted of six "leafy" taxa making up 16.7% of the total bryophyte flora. *Sphagnum* (peat moss; Sphagnaceae) was the most abundant bryophyte genus in the peatland. Eleven *Sphagnum* species accounted for 30.6% of the total bryophyte species diversity. The most diverse group of bryophytes present in the peatland was the mosses (Bryopsida), consisting of 19 species that composed 52.8% of the total bryophyte species richness. The most diverse family of the mosses was the Amblystegiaceae, represented by four genera and six species, a total of 17% of the bryophytes.

Crum (1983) cites the presence of six species of Bryopsida at Little Dollar Lake that were not located during this inventory: *Dicranum scoparium* Hedw. (Dicranaceae), *Mnium spinulosum* Bruch & Schimp. in B. S. G. (Mniaceae), *Brachythecium populeum* (Hedw.) Schimp. in B. S. G. and *B. reflexum* (Starke in Web. & Mohr) Schimp. in B. S. G. (Brachytheciaceae), *Herzogiella turfacea* (Lindb.) Iwats. (Hypnaceae), and *Polytrichum formosum* Hedw. (Polytrichaceae). These collections are cited as "Mackinac County: Little Dollar Lake." Until the herbarium

Table 2. Visual abundance index employed in the bryophyte and vascular species inventory.

Abundant:	Dominant or codominant in at least one cover type.
Frequent:	Easily recognizable in one or more cover types, but not the most dominant in any single community.
Occasional:	Widely distributed throughout the peatland, can be located relatively easily.
Infrequent:	Difficult to find due to scant populations limited to several localities.
Rare:	Very difficult to find, limited to two or fewer distinct localities in the peatland.

vouchers are examined, it will remain unclear whether these species were collected within the peatland basin or in the upland habitats within the surrounding forests. Based on their characteristic habitats, it is probable that these species were collected in the vicinity of Little Dollar Lake, but not within the peatland itself.

The vascular flora of Little Dollar Lake peatland was composed of 93 species representing 38 families and 62 genera (Table 1). Due to recent annotations during the summer of 1997, the following species list differs slightly from the inventory presented in Hellquist (1996). The two best-represented families in the peatland flora were the Cyperaceae and the Ericaceae. The Cyperaceae (18 species) accounted for 20% of the total flora, while the Ericaceae (8 species) accounted for 9% of the total flora. *Hieracium piloselloides* and *Rumex obtusifolius* were the only nonnative species present. One species, *Potamogeton confervoides,* is protected under the Endangered Species Act of the State of Michigan (Public Act 203 of 1974, as amended) with "Threatened" status (Beaman et al. 1985; Anonymous 1994).

In the following checklist, overall abundance of the species growing in the peatland was estimated visually using an abundance index (Table 2) modified from a similar index of Palmer et al. (1995). The checklist designates mat areas with the following acronyms: EM = Eastern Mat, NM = Northern Mat, NWM = Northwestern Mat, SM = Southern Mat, SME = Southern Mat Extension, SWM = Southwestern Mat, and WM = Western Mat.

THE BRYOPHYTE AND VASCULAR FLORA OF LITTLE DOLLAR LAKE PEATLAND

BRYOPHYTA (Bryophytes)

HEPATICOPSIDA (Liverworts)

CEPHALOZIACEAE

Cladopodiella fluitans (Nees) Joerg. Occasional; throughout the ericaceous scrub of the peatland, especially in moist areas among *Sphagnum majus*; also on exposed peat along the lake margin, deer trails, or on hummocks.

Cephalozia connivens (Dicks.) Lindb. Rare; SWM southern lagg, on rotting wood.

CEPHALOZIELLACEAE

Cephaloziella elachista (Jack) Schiffn. Rare; SWM, leaf litter in the ericaceous scrub.

Cephaloziella hampeana (Nees) Schiffn. Rare; SME, in moist, decaying leaf litter in the ericaceous scrub.

LOPHOCOLEACEAE

Lophocolea heterophylla (Schrad.) Dum. Rare; SWM southern lagg, on rotting wood.

Chiloscyphus polyanthos (L.) Corda. Rare; SWM southern lagg, on rotting wood.

SPHAGNOPSIDA (Peat Mosses)

SPHAGNACEAE

Section *Sphagnum*

Sphagnum magellanicum Brid. Abundant; throughout the peatland, a dominant species of the ericaceous scrub and floating *Sphagnum* lawn; often initiates hummock topography and forms the basal areas of hummocks.

Sphagnum papillosum Lindb. Abundant; the primary pioneer *Sphagnum* species forming a lush fringe that extends into the open water of the lake from the floating mat; also forms undulating patches on the *Sphagnum* lawn and in low-lying areas of the ericaceous scrub.

Section *Squarrosa*

Sphagnum squarrosum Crome. Rare; SWM, SME lagg, in leaf litter or on decorticated logs.

Section *Cuspidata*

Sphagnum cuspidatum Ehrh. ex Hoffm. Infrequent; most prominent in the southeastern lagg of the SME, often intermixed with *S. majus* in areas subject to periodic inundation; occasionally found along the lake margin with *S. papillosum.*

Sphagnum majus (Russ.) C. Jens. Frequent; throughout the peatland in damp hollows and low troughs in wet saturated areas of the mat; especially prominent on the EM and WM.

Sphagnum recurvum P. Beauv., *sensu lato.* Abundant; the most prominent bryophyte in the peatland, exhibiting the widest ecological amplitude of all the *Sphagnum* species present; throughout the peatland along the upper edges of shallow, damp hollows of the ericaceous scrub; occasionally among *S. papillosum* at the lake margin.

Section *Subsecunda*

Sphagnum subsecundum Nees in Sturm, *sensu lato.* Infrequent; among *Carex lasiocarpa* in the eastern lagg of the southern mat extension, and at the bases of the taller hummocks at the constriction of the SM and SME, also on the EM and WM.

Section *Acutifolia*

Sphagnum capillifolium (Ehrh.) Hedw. Frequent; scattered throughout the peatland, usually at intermediate levels of hummocks; also forms extensive, flat lawns on or near the *Sphagnum* lawns within ten meters of the lake.

Sphagnum fimbriatum Wils. in Wils. & J. D. Hook. Rare; limited to large hummocks along the upland on the eastern and western mats.

Sphagnum fuscum (Schimp.) Klinggr. Infrequent; Widely scattered populations on hummock tops within the ericaceous scrub; occasionally on the *Sphagnum* lawn of the SM.

Sphagnum russowii Warnst. Rare; a single population located on hummocks >1.0 m at the edge of the *Calamagrostis canadensis* lagg where the lagg merges into the ericaceous scrub on the northern edge of the NM.

BRYOPSIDA (Mosses)

AMBLYSTEGIACEAE

Calliergon cordifolium (Hedw.) Kindb. Frequent; forms lush carpets in densely shaded areas of graminoid lagg.

Calliergon stramineum (Brid.) Kindb. Infrequent; Widely scattered, typically on top of drier hummocks in the ericaceous scrub.

Campylium chrysophyllum (Brid.) J. Lange. Rare; SWM southwestern lagg, adjacent to the truck trail, intermixed with *Brachythecium rutabulum* on decorticated wood.

Sanionia uncinata (Hedw.) Loeske [*Drepanocladus uncinatus* (Hedw.) Warnst.]. Rare; a single population on a decorticated *Betula papyrifera* trunk fallen into the southwestern lagg of the SME.

Warnstorfia exannulata (Schimp. in B. S. G.) Loeske [*Drepanocladus exannulatus* (Schimp. in B. S. G.) Warnst.]. Infrequent; SME eastern lagg, carpeting exposed muck pools; during wet years, it grows submerged here.

Warnstorfia fluitans (Hedw.) Loeske [*Drepanocladus fluitans* (Hedw.) Warnst.]. Infrequent; usually in saturated hollows among *Sphagnum majus*; also in the stream channel at the constriction of the SM and SME.

AULACOMNIACEAE

Aulacomnium palustre (Hedw.) Schwaegr. Occasional; on hummocks or along deer trails.

BRACHYTHECIACEAE

Brachythecium rutabulum (Hedw.) Schimp. in B. S. G. Rare; SWM southwestern lagg adjacent to the truck trail, with *Campylium chrysophyllum* on decorticated wood.

BRYACEAE

Bryum capillare Hedw. Occasional; sporadic on hummocks throughout the ericaceous scrub.

Pohlia nutans (Hedw.) Lindb. Infrequent; scattered in open lagg habitats and in the ericaceous scrub.

CLIMACIACEAE

Climacium dendroides (Hedw.) Web. & Mohr. Rare; in rich muck and on decorticated logs in the eastern lagg of the SME.

DICRANACEAE

Dicranum flagellare Hedw. Infrequent; dry hummock tops among leaf litter of the ericaceous scrub.

Dicranum montanum Hedw. Rare; among *Chamaedaphne calyculata* branches in the ericaceous scrub of the SWM.

Dicranum undulatum Brid. Infrequent; on the sides or on top of *Sphagnum* hummocks in the ericaceous scrub.

HYPNACEAE

Callicladium haldanianum (Grev.) Crum. Infrequent; on dry hummocks or on decorticated wood.

HYLOCOMIACEAE

Pleurozium schreberi (Brid.) Mitt. Infrequent; on dry hummocks; occasionally in the lagg on decorticated wood.

PLAGIOTHECIACEAE

Plagiothecium denticulatum (Hedw.) Schimp. in B. S. G. Rare; SWM southern lagg, in leaf litter and on decorticated logs.

POLYTRICHACEAE

Polytrichum commune Hedw. Occasional; on old beaver lodges.

Polytrichum strictum Brid. Occasional; usually on relatively dry, open hummocks in the ericaceous scrub, also on old beaver lodges.

LYCOPODIOPHYTA (Lycopods)

ISOËTACEAE

Isoëtes echinospora Durieu, Quillwort. Infrequent; submerged in the lake, especially along the eastern shore.

LYCOPODIACEAE

Lycopodiella inundata (L.) Holub [*Lycopodium inundatum* L.], Bog-clubmoss. Rare; NWM, *Sphagnum* lawn.

EQUISETOPHYTA (Horsetails)

EQUISETACEAE

Equisetum fluviatile L., Water-horsetail. Infrequent; SME, mucky lagg.

POLYPODIOPHYTA (Ferns)

DRYOPTERIDACEAE

Dryopteris intermedia (Muhl. ex Willd.) A. Gray, Fancy wood-fern. Rare; SME, SWM, on rotting nurse logs in the lagg.

OSMUNDACEAE

Osmunda cinnamomea L., Cinnamon fern. Rare; SWM, on rotting nurse log in the lagg.

PINOPHYTA (Conifers)

PINACEAE

Abies balsamea (L.) Miller, Balsam fir. Infrequent; NWM, SWM, sporadic along the interface of the *Sphagnum* lawn and ericaceous scrub.

Larix laricina (Duroi) K. Koch, Tamarack. Occasional; NWM, SM, open areas of the *Sphagnum* lawn along the interface of the ericaceous scrub.

Picea mariana (Miller) BSP., Black spruce. Occasional; throughout the peatland especially on the *Sphagnum* lawn or in the ericaceous scrub near the *Sphagnum* lawn.

Pinus resinosa Aiton, Red pine. Rare; SM, a single juvenile, approximately 1.0 m tall, on the *Sphagnum* lawn.

Pinus strobus L., White pine. Occasional; the most abundant conifer, found on all mats, typically in the ericaceous scrub or along its interface with the lagg.

MAGNOLIOPHYTA (Flowering Plants)

MAGNOLIOPSIDA (Dicotyledons)

ACERACEAE

Acer rubrum L., Red maple. Occasional; seedlings and saplings scattered throughout the bog mat, established in the lagg or on hummocks of the ericaceous scrub.

Acer saccharum Marshall, Sugar maple. Rare; SWM, extremely sporadic seedlings found in the ericaceous scrub.

AQUIFOLIACEAE

Ilex verticillata (L.) A. Gray, Winterberry. Occasional; sporadic individuals in the ericaceous scrub near the lagg as well as within the lagg itself.

Nemopanthus mucronatus (L.) Loes., Mountain holly. Occasional; sporadic individuals in the lagg.

ASTERACEAE

Bidens cernua L., Nodding beggar-ticks. Occasional; NM, SME, primarily in shaded lagg areas in wet, mucky leaf litter.

Bidens connata Muhl., Purplestem beggar-ticks. Occasional; NM, SME, primarily in shaded lagg areas in wet, mucky leaf litter.

Hieracium piloselloides Villars, Yellow hawkweed. Rare; a single individual located on the beaver lodge on the NWM, apparently dispersed from plants growing along the shoulder of the truck trail; introduced from Europe (Gleason and Cronquist 1991).

BALSAMINACEAE

Impatiens capensis Meerb., Spotted touch-me-not. Infrequent; SWM lagg, adjacent to the truck trail.

BETULACEAE

Betula alleghaniensis Britton, Yellow birch. Rare; NM, saplings in the lagg.

Betula papyrifera Marshall, White birch. Occasional; scattered saplings on all peatland mats, often on old beaver lodges.

CAPRIFOLIACEAE

Viburnum nudum L. var. *cassinoides* (L.) T. & G., Wild-raisin. Occasional; in lagg areas, especially on the NM.

CLUSIACEAE

Hypericum boreale (Britton) E. Bickn., St. John's wort. Infrequent; EM, NM, NWM, beaver lodges and rotting nurse logs; in 1996, *H. boreale* forma *callitrichoides* Fassett, a partially submerged aquatic form, was frequent along the lake shore, especially along the EM.

Hypericum majus (A. Gray) Britton, St. John's wort. Infrequent; EM, NWM, beaver lodges and rotting nurse logs.

Triadenum fraseri (Spach) Gleason, Marsh St. John's wort. Frequent; throughout the peatland in wet areas along the lake margin, stream channel, and in mucky lagg areas.

DROSERACEAE

Drosera intermedia Hayne, Sundew. Rare; NWM *Sphagnum* lawn on exposed peat.

Drosera rotundifolia L., Sundew. Frequent; inconspicuous, on the *Sphagnum* lawn or in damp, sheltered microhabitats on hummocks.

ERICACEAE

Andromeda glaucophylla Link, Bog-rosemary. Frequent; widely scattered throughout, especially in the ericaceous scrub.

Chamaedaphne calyculata (L.) Moench, Leatherleaf. Abundant; the most dominant species of the peatland; invades open water, stunted sprigs on the *Sphagnum* lawn, ubiquitous in the ericaceous scrub, especially robust individuals inhabit areas where the graminoid lagg association was absent.

Kalmia polifolia Wangenh., Bog-laurel. Frequent; throughout all peatland mats, especially prominent in the ericaceous scrub.

Ledum groenlandicum Oeder, Labrador-tea. Occasional; SM, SWM, dry hummocks of the ericaceous scrub.

Vaccinium angustifolium Aiton, Low sweet blueberry. Occasional; on well-elevated, dry hummocks in the ericaceous scrub.

Vaccinium macrocarpon Aiton, Large cranberry. Frequent; among ericaceous shrubs growing into the lake and along the stream channel, also conspicuous on the EM and WM.

Vaccinium myrtilloides Michx., Velvetleaf blueberry. Infrequent; SME lagg, on rotting nurse logs, rarely in the ericaceous scrub.

Vaccinium oxycoccos L., Small cranberry. Frequent; on dry, open hummocks in the ericaceous scrub; also on the *Sphagnum* lawn.

LAMIACEAE

Lycopus uniflorus Michx., Bugleweed. Frequent; SM, SWM, SME, graminoid lagg.

Scutellaria galericulata L., Marsh skullcap. Frequent; lagg habitats, especially the SWM lagg adjacent to the truck trail.

Scutellaria lateriflora L., Mad-dog skullcap. Rare; SWM lagg, adjacent to the truck trail.

LENTIBULARIACEAE

Utricularia geminiscapa Benj., Mixed bladderwort. Frequent; free-floating in the lake along the peatland mat.

Utricularia intermedia Hayne, Northern bladderwort. Infrequent; limited to the periodically inundated muck pools of the southeastern lagg of the SME.

MENYANTHACEAE

Menyanthes trifoliata L., Buckbean. Occasional; prefers saturated habitats such as exposed peat along the lake margin or stream channel.

NYMPHAEACEAE

Nuphar variegata Durand, Yellow pond-lily. Rare; two sites, one aquatic and one semiterrestrial; the single aquatic population off the NWM; a cluster of stranded individuals among *Sphagnum majus, Carex lasiocarpa,* and *Potentilla palustris* in the lagg of the SME near the stream channel.

Nymphaea odorata Aiton, Fragrant water-lily. Rare; SM, SWM, isolated individuals among *Chamaedaphne calyculata* branches and *Sphagnum* encroaching into the lake.

ONAGRACEAE

Epilobium ciliatum Raf., American willow-herb. Rare; SWM lagg, a single localized population adjacent to the truck trail.

Epilobium leptophyllum Raf., American marsh willow-herb. Rare; NM, on the beaver lodge.

POLYGONACEAE

Polygonum amphibium L., Water smartweed. Infrequent; in lagg communities or in wet hollows of the ericaceous scrub.

Polygonum cilinode Michx., Fringed bindweed. Rare; SWM lagg, adjacent to the truck trail.

Rumex obtusifolius L., Bitter dock. Rare; SWM lagg, adjacent to the truck trail; introduced from Europe (Gleason and Cronquist 1991).

PRIMULACEAE

Lysimachia terrestris (L.) BSP., Swamp-candles. Frequent; SWM lagg, adjacent to the truck trail.

Lysimachia thyrsiflora L., Tufted-loosestrife. Frequent; SWM, SME in partially shaded lagg habitats.

ROSACEAE

Aronia prunifolia (Marshall) Rehder, Chokeberry. Infrequent; NM, NWM mats, widely scattered in the ericaceous scrub adjacent to the lagg.

Potentilla palustris (L.) Scop., Marsh cinquefoil. Frequent; in low, wet, mucky habitats along the stream channel or in the lagg.

Rubus canadensis L., *sensu lato,* Blackberry. Rare; NWM, SWM lagg, adjacent to the truck trail.

Spiraea alba Duroi, Meadowsweet. Infrequent; SME lagg, often on decorticated nurse logs.

RUBIACEAE

Galium tinctorium L., Southern three-lobed bedstraw. Frequent; SM, SWM, SME lagg.

SALICACEAE

Salix pedicellaris Pursh, Bog willow. Infrequent; SME lagg, scattered in wet, mucky habitats.

Salix petiolaris J.E. Smith, Meadow willow. Rare; SM lagg, isolated populations near the constriction joining the SM and the SME.

SARRACENIACEAE

Sarracenia purpurea L., Pitcher plant. Frequent; throughout the *Sphagnum* lawn, usually within a few meters of the lake margin, also in hollows of the ericaceous scrub.

VIOLACEAE

Viola macloskeyi F. Lloyd, Smooth white violet. Infrequent; SWM, SME lagg, in partially shaded habitats, on decorticated nurse logs or among leaf litter.

LILIOPSIDA (Monocotyledons)

ARACEAE

Calla palustris L., Wild calla. Occasional; in wet, mucky habitats along the lake margin, stream channel, and lagg.

CYPERACEAE

Carex brunnescens (Pers.) Poiret, Sedge. Rare; SWM lagg, on decorticated nurse logs.

Carex canescens L., Sedge. Abundant; sunken, wet habitats, prominent along the lake margin, also in the graminoid lagg and in the mucky periphery of the stream channel.

Carex chordorrhiza L.f., Sedge. Rare; SME, a single population along the muck pools.

Carex echinata Murray, Star-sedge. Infrequent; NWM, SWM, in the lagg or on beaver lodges.

Carex lasiocarpa Ehrh., Sedge. Abundant; one of the dominant species of the graminoid lagg, also in hollows of the ericaceous scrub adjacent to lagg areas; a major pioneer instrumental in the terrestrialization of the stream channel.

Carex limosa L., Sedge. Occasional; wet microhabitats along the lake margin, *Sphagnum* lawn, or graminoid lagg.

Carex oligosperma Michx., Sedge. Abundant; throughout the peatland, in hollows between hummocks; the dominant sedge species of the open ericaceous scrub.

Carex retrorsa Schweinitz, Sedge. Infrequent; SWM graminoid lagg, in mucky leaf litter.

Carex stipata Muhl., Sedge. Rare; SWM, a single population in the graminoid lagg.

Carex utriculata F. Boott, Sedge. Occasional; SM, in wet areas along the stream channel, also in deer trails.

Carex vesicaria L., Sedge. Rare; SME, shaded lagg habitats.

Dulichium arundinaceum (L.) Britton, Three-way sedge. Occasional; SM, SME, scattered in and along the muck pools, also in exposed peat along the stream channel.

Eleocharis intermedia (Muhl.) Schultes, Spike-rush. Infrequent; NW, SM, isolated individuals in exposed peat along the lake margin.

Eriophorum gracile Koch, Slender cotton-grass. Rare; SWM, a single locality in the graminoid lagg near the junction of the WM.

Eriophorum vaginatum L. [*E. spissum* Fern.], Tussock cotton-grass. Infrequent; isolated localities primarily on the *Sphagnum* lawn of the SWM.

Eriophorum virginicum L., Tawny cotton-grass. Frequent; in hollows throughout the ericaceous scrub and *Sphagnum* lawn.

Rhynchospora alba (L.) Vahl, Beak-rush. Frequent; in saturated microhabitats along the lake margin and stream channel.

Scirpus cyperinus (L.) Kunth, Wool-grass. Occasional; SM, SWM, SME, sporadic in the lagg.

ERIOCAULACEAE

Eriocaulon aquaticum (Hill) Druce [*E. septangulare* With.], Pipewort. Frequent; colonizes exposed peat along the lake margin, also submerged in the lake.

IRIDACEAE

Iris versicolor L., Wild blue flag. Frequent; throughout graminoid lagg areas, especially in the SWM.

JUNCACEAE

Juncus alpinus Vill., Rush. Infrequent; SME, mucky lagg.

Juncus brevicaudatus (Engelm.) Fern., Rush. Rare; EM, a single locality on a decorticated nurse log.

Juncus effusus L., Soft rush. Occasional; widely scattered, usually in hummocky lagg habitats.

ORCHIDACEAE

Calopogon tuberosus (L.) BSP., Grass-pink. Rare; *Sphagnum* lawn of the SM and the NWM in open areas near the lake margin.

Pogonia ophioglossoides (L.) Ker Gawler, Rose pogonia. Rare; NWM, *Sphagnum* lawn in open areas near the lake margin.

POACEAE

Calamagrostis canadensis (Michx.) P. Beauv., Blue-joint. Abundant; the dominant species in the open, graminoid lagg that fringes areas of the NM, NWM, SWM, SM and SME.

Glyceria borealis (Nash) Batchelder, Northern mannagrass. Infrequent; SME, in mucky lagg areas.

Glyceria canadensis (Michx.) Trin., Rattlesnake grass. Occasional; in wet habitats along the stream channel, the northern outlet channel, and in the lagg.

Puccinellia pallida (Torr.) R. T. Clausen. Infrequent; SWM, SME, mucky graminoid lagg habitats.

POTAMOGETONACEAE

Potamogeton confervoides Reichb., Alga-pondweed. Abundant; Submersed in open water and among the branches, roots, and rhizomes of ericaceous shrubs along the lake margin; State status—Threatened.

Potamogeton oakesianus Robbins, Oakes' pondweed. Rare; SME lagg, a single population restricted to the muck pools.

SCHEUCHZERIACEAE

Scheuchzeria palustris L., Pod-grass. Occasional; SM, SWM, on the *Sphagnum* lawn or along the lake margin, inhabiting hollows and saturated level areas, usually among *Sphagnum majus.*

SPARGANIACEAE

Sparganium minimum (Hartman) Fries, Bur–reed. Rare; SME, restricted to the periodically inundated muck pools of the southeastern lagg.

TYPHACEAE

Typha latifolia L., Common cat-tail. Infrequent; two small, widely separated populations in the basin; the largest locality in the lagg of the SWM where runoff from the truck trail drains into the peatland basin; the smaller locality, isolated in the SME near the stream channel.

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